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United States Department of Agriculture,

WEATHER BUREAU,

DIVISION OF AGRICULTURAL SOILS.

INSTRUCTIONS FOR TAKING SAMPLES OF SOIL FOR MOISTURE DETERMINATIONS.

OBJECT OF THE WORK.

An important feature of the work of this Division is to study the circulation of water in some of the important types of soils in the United States and to supplement the present work of the Weather Bureau by continuing the study of the rainfall after it enters the soil, where it is of most value to crops. Rain falls on an average for two or three consecutive days, and is followed by an interval of eight or ten days of fair weather. The soil has to offer such a resistance to the descent of the rainfall that a sufficient quantity of water may be retained for the use of crops during this fair weather period. Light sandy soils offer relatively little resistance to the rainfall and they maintain but a small supply of water for the use of plants. Heavy clay soils, on the other hand, offer a very much greater resistance to the descent of the rainfall, and they can maintain three or four times as much water as the sandy soils. The supply of water which soils maintain has a very important bearing upon the adaptability of crops to soils, because in nature, as in a greenhouse, the amount of water supplied to plants influences their development, yield, texture, quality, vitality, and time of ripening. Soils differ very widely in their power of retaining water and crops differ fully as much in the amount of water they require for their best development. If, therefore, the amount of moisture which a soil maintains under prevailing climatic conditions is not favorable to a particular crop, it may be more favorable to another class of crops, or else the relation of the soil to moisture may be so changed, through judicious methods of cultivation or manuring, that the soil shall maintain more or less of the rainfall, as seems desirable. It is important, therefore, to study the relation of soils to moisture and to determine the ease with which, through proper methods of cultivation and manuring, the different types of soil can maintain an adequate supply of water for the best development of the different staple crops.

THE SOIL.

In taking samples of soil for moisture determinations to determine the underlying principles of the relation of the moisture of the soil to the development and yield of crops, and to determine the most favorable conditions of moisture for the best development of crops, it is very important that the spot selected for taking the samples should represent fairly well the typical conditions of a considerable area of land. It should, if possible, represent the best type of land for the staple crop or crops of the locality and yet represent a large area of land. If the locality is adapted to a certain grade of tobacco the samples should be taken in the soil which is considered the best type for that crop. If the staple crop is cotton the sample should be taken in what is considered the finest cotton soil. If the truck crops are the staple the sample should be taken in the soil peculiarly adapted to the truck crops. The soil sampled should recently have been under actual cultivation in the crop or crops best adapted to it, so that the real agricultural value of the land can be accurately known. The land should not, however, be under cultivation while this work is going on. A plat about 20 feet square should be laid off, if possible, some distance from roads, fences, and trees, and kept free from grass and weeds throughout the growing season by having these removed by hand or by going over the surface very lightly with a sharp hoe. The surface should in this way be kept perfectly free and bare of vegetation and should not be cultivated, as the data from different localities are to be compared, and it would be impossible to secure a uniform system of cultivation which would make the results, under cultivation, strictly comparable.

It is desirable and even necessary that where possible an additional sample be taken from the same kind of soil actually under cultivation in the staple crop, so as to determine the effect of cultivation and cropping upon the circulation of water within the soil. This will require a separate sample, and care must be taken that these samples shall each be correctly and distinctly labeled.

Where there is a soil in the immediate vicinity, perhaps only separated by a fence or road, which is entirely unsuited to the staple crop, it would in many cases be of great interest and importance to study the unfavorable conditions in this soil and compare them with the conditions in the other soil which are known to be favorable to the crops, in order to throw light upon the conditions which are actually necessary for the best development of the crops. In this case a separate sample should be taken from an uncultivated plat, from which the grass and weeds are removed by hand or by hoe, so that the results shall be strictly comparable with the samples obtained from the first-named locality. This will require an additional sampling tube, and this must be carefully and distinctly labeled, so as to keep it separate from the other samples.

Where the samples should be taken.—The samples should be taken some distance away from fences, roads, or trees. The principal sample, to

form the basis of the work, should be taken from a piece of bare ground as already explained. Where other samples are required and plants are growing in the field the sample should be taken about midway between two plants. Where the plants are growing on a bed or hill the sample should be taken on this, taking the top of the bed or hill for the surface of the ground.

When the samples should be taken.—The samples of soil should be taken once a day, as nearly as possible at the same time each day, so that the samples from different localities can be compared. If rain threatens, the samples should be taken before rather than after the rain, but they should be taken when the time comes regardless of the weather. The sample should be taken at 6 p. m., or as near this hour as possible. The exact time of taking the sample should be stated on the shipping tag.

How the samples should be taken.—The surface of the land should be free from grass, weeds, and remains of vegetable matter. A brass sampling tube about seven-eighths of an inch in diameter and 15 inches long is driven down 12 inches into the soil to the mark on the side of the tube. To prevent friction on the inside of the tube forcing the soil down a cutting edge is inserted into one end of the tube, which reduces the diameter of the core of soil somewhat and reduces this friction. The tube should be driven down with a number of sharp, quick taps with a piece of wood rather than by heavy blows. With a slight lateral movement to break off the column of soil the tube can be pulled up without dropping any of the sample. Rubber caps should be immediately slipped over both ends of the tube upon its being withdrawn from the soil, so as to prevent any evaporation or loss of moisture from the sample. Be sure the caps are well down over the ends of the tube, and that the balls in the rubber caps fit into the ends of the brass tube so as to prevent the rubber being cut by the sharp edges.

How to label and ship samples.—Put the tube, securely covered with the rubber caps, into the sack, and fill out the form on the back of the shipping tag which is attached to the sack for the identification of the sample when it is received at the Department of Agriculture. See that the sack is securely tied and that the shipping tag is securely attached to it. When these sampling tubes are sent out from the Department with Government franks attached for their return they require no postage, but can be sent through the mail without any expense for postage to the sender.

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Chief of Division.

Approved:

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